

REMARKS

Claims 1 and 12 stand rejected as being unpatentable over U.S. Patent No. 5,363,039 ('039) in view of U.S. Patent No. 5,892,342 ('342). Claims 7-8, 11 and 13 stand rejected as being unpatentable in view of the foregoing references and further in view of U.S. Patent No. 6,100,660 ('660). Claims 2-6 and 9-10 stand rejected under §112, fourth paragraph as failing to further limit the independent claims. Figure 1 of the drawings was objected to. Reconsideration of the rejections and drawing objection is solicited in view of the foregoing amendments and the following remarks.

Applicant has amended FIG. 1, as suggested in the Office Action, essentially to remove graphical details that may arguably clutter that figure. The specification was amended to linguistically identify some of the elements shown in FIG. 1. Albeit each of these elements would be readily recognized by one of ordinary skill in the art, for the sake of expeditiously moving forward, and/or adding clarity, applicant has tried to comply with the suggestions made in the Office Action regarding FIG. 1. Accordingly, applicant respectfully asserts that, as amended, FIG. 1 will assist one of ordinary skill in the art to better understand an exemplary environment where the inventive concepts of the invention may be practiced and, consequently, applicant requests that this objection be removed.

Claims 2, 3, 9 and 10 have been canceled and, consequently, the §112, fourth paragraph grounds of rejection regarding these claims are presently moot. However, applicant respectfully disagrees that claims 5 and 6 are subject to any §112, fourth paragraph issues and accordingly requests that these grounds of rejection for claims 5 and 6 be removed.

Regarding any rejection under 35 U.S.C. §103, it is respectfully noted that the test for patentability is whether there is some teaching or suggestion in the prior art references to support their use to reject the claimed invention. It is a basic tenet of patent law that the PTO is not permitted to ignore the results and advantages produced by claimed subject matter, of which the prior art is devoid, simply because the recited structure may be similar to that otherwise barren prior

art. Further, when evaluating a claim for determining obviousness, all structural and operational interrelationships of the claim must be evaluated.

Applicant further notes that it is impermissible to use the claimed invention as an instruction manual or “template” to piece together the teachings of the prior art so that the claimed invention is rendered obvious. The Court of Appeals Federal Circuit has previously stated that “[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.”

Claim 1, as amended, is directed to a method for detecting, during normal operation of a locomotive and without interrupting the locomotive operation, faults indicative of an electrical short condition in at least one power device of a plurality of power devices of a propulsion system of the locomotive. The plurality of power devices is connected in parallel circuit to an external direct current power source operationally coupled for electrically powering the propulsion system as the locomotive travels along a rail track proximate to the external power source. Upon the external power source being electrically connected to the locomotive propulsion system when the locomotive is on the rail track proximate to the external power source, an initial voltage is measured across a power line filter in a circuit with the power devices. Voltage developed across the line filter is measured upon waiting a predefined transient time interval. The presence of an electrical short condition in at least one of the power devices is determined based on whether the magnitude of the voltage developed across the line filter rises to about power line voltage within the predefined transient time interval. The transient time interval is sufficiently short to avoid interrupting the locomotive operation and avoid damage to the propulsion system in the event the electrical short condition is actually present. The time interval is sufficiently long relative to the time constant of the filter to enable the voltage to rise to about line voltage when a short condition exists.

The '039 reference is directed to apparatus and method for auto-self testing of a power converter and motor system. The '039 reference in particular provides a test capability to identify short-circuit conditions prior to initiating

operation of an inverter. See col. 1, line 48 et. seq. of the '049 reference. By way of comparison, claim 1 is directed to a method for detecting faults indicative of an electrical short condition during normal operation of the locomotive and without interrupting the locomotive operation. The Office Action correctly acknowledges that the '039 reference does not use a line filter for performing the operational relationships set forth in claim 1. The Office Action then applies the '342 reference simply because that reference shows a DC link capacitor 47.

Applicant notes that the '342 reference is directed to a self-test system for a shorted diode protection circuit in an electric vehicle propulsion system. That is, the '342 reference recognizes that if a short condition were to develop in a rectifier circuit electrically coupled to receive power from a locomotive generator, then severe damage to the generator could occur. Accordingly, the '342 reference explains that a shorted diode protection circuit is included. The effect of the shorted diode protection circuit is to reduce the output current of the generator before a maximum short circuit current is realized. The '342 reference goes on to describe innovative techniques for determining whether or not this shorted diode protection circuit is actually operative. By way of comparison, the present invention does not rely on any separate protection circuit since the techniques of the present invention essentially in real time and during normal operation of the locomotive allow determining faults indicative of an electrical short condition directly in at least one power device of a plurality of power devices of a propulsion system of the locomotive.

The '342 reference makes clear that the self-test described therein is run before cranking or starting the locomotive. For example, no power is applied to field winding 12F and the alternator 12 is not producing any output power. See col. 6, line 4 et. seq., of the '342 reference. By way of comparison, the method of the present invention is performed during normal operation of the locomotive. This is advantageous in the locomotive industry since the longer that a locomotive can be operationally utilized, the more economic return from the locomotive.

Although applicant recognizes that the '342 reference shows a field line capacitor, applicant respectfully submits that the '342 reference does not make a determination of a short condition in at least one of the power devices based on whether the magnitude of the voltage developed across the line filter rises to about power line voltage within a predefined transient time interval. In fact, the self-test described in the '342 reference is not concerned with making any determination of a short condition in the SCRs that make up the protection circuit. What the self-test determines is that the SCRs in the protection circuit are actually responsive to be commanded into a conductive state. To that effect, a current sensor 41 (FIG. 2) is used for detecting current flow through the SCRs once they are placed in the conductive state. See Col. 6, line 20 et. seq., of the '342 reference. This is very different from the operational relationships set forth in claim 1. It is respectfully submitted that the '342 reference fails to remedy the shortcomings of the '039 reference and consequently such references, singly or in combination, fail to render obvious claim 1. Since each of the dependent claims from independent claim 1 includes the structural and/or operational relationships respectively recited in such independent claim, it is also respectfully submitted that '342 and '039, singly or in combination, also fail to obviate each of such dependent claims.

Claim 7, as amended, is directed to a method for detecting, during normal operation of a locomotive and without interrupting the locomotive operation, faults indicative of an electrical open condition in at least one power device of a plurality of power devices of a propulsion system of the locomotive. The plurality of power devices is connected in parallel circuit to an external direct current power source operationally coupled for electrically powering the propulsion system as the locomotive travels along a rail track proximate to the external power source. Temperature of each power device connected in parallel circuit to the power source is monitored. The temperature of each power device is related to the temperature of the other devices to determine the occurrence of the electrical open condition based on whether a temperature difference for any power device exceeds a predefined limit relative to the other devices. The Office

action correctly recognizes that neither the '342 reference nor the '039 reference teach or suggest the use of temperature information for determining an electrical open condition in at least one power device of a plurality of power devices connected in parallel circuit to an external power source. The Office Action then applies the '660 reference in an attempt to overcome the foregoing shortcomings of '342 and '039.

The '660 reference is directed to a current supply controller for an electric motor. An express object of this reference is to increase the electric motor output and protect the switching element of the motor from heat breakdown. See col. 1, line 60 et. seq. of the '660 reference. Although the '660 reference uses temperature sensing, the '660 reference does not teach or suggest temperature sensing for making a determination of an electrical open condition in at least one power device of a plurality of power devices connected in parallel circuit to an external power source. The '660 reference simply monitors temperature of a given switching element and uses that information to modulate in his controller the amount of current passing through that switching element so that such current remains within an allowable value. This is very different from the operational relationships recited in claim 7, such as monitoring temperature of each power device connected in parallel circuit to the power source and relating the temperature of each power device to the other devices to determine the occurrence of the electrical open condition based on whether a temperature difference for any power device exceeds a predefined limit relative to the other devices.

In view of the foregoing, it is respectfully submitted that the '660 reference fails to remedy the shortcomings of '039 and '342 and consequently such references, singly or in combination, fail to render obvious claim 7. Since each of the dependent claims from independent claim 7 includes the structural and/or operational relationships respectively recited in such independent claim, it is also respectfully submitted that '342, '039, and '660, singly or in combination, also fail to obviate each of such dependent claims.

Claim 11, as amended, is directed to a method for detecting, during normal operation of a locomotive and without interrupting the locomotive operation, electrical fault conditions in at least one power device of a plurality of power devices of a propulsion system of the locomotive. The plurality of power devices is connected in parallel circuit to an external direct current power source operationally coupled for electrically powering the propulsion system as the locomotive travels along a rail track proximate to the external power source. Claim 11 in part recites a first sequence of actions for determining an electrical short condition upon the power source being electrically connected to the locomotive propulsion system when the locomotive is on the rail track proximate the external power source, wherein the first sequence of actions is performed within a transient time interval sufficiently short to avoid interrupting the locomotive operation and avoid damage to the propulsion system in the event the electrical short condition is actually present. The time interval is also sufficiently long relative to the time constant of the filter to enable the voltage to rise to about line voltage when a short condition exists. Claim 11 further recites a second sequence of actions for determining an electrical open condition during the occurrence of a high current event.

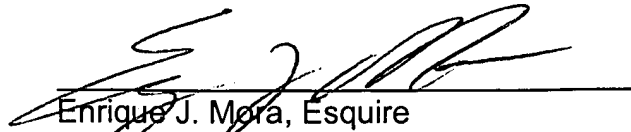
As discussed above, it is respectfully submitted that '039, '342 and '660, singly or in combination, fail to teach or suggest the operational and/or structural relationships set forth in claim 11 and consequently such references fail to render obvious claim 11. Since each of the dependent claims from independent claim 11 includes the structural and/or operational relationships respectively recited in such independent claim, it is also respectfully submitted that '342, '039, and '660, singly or in combination, also fail to obviate each of such dependent claims.

It is respectfully submitted that each of the claims pending in this application recites patentable subject matter and it is further submitted that such claims comply with all statutory requirements and thus each of such claims should be allowed.

The applicant appreciates the Examiner's efforts for conducting a thorough examination, and cordially invites the Examiner to call the undersigned

attorney if there are any outstanding items that may be resolved via telephone conference.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'E. J. Mora', is written over a horizontal line.

Enrique J. Mora, Esquire
Registration No. 36,875
Beusse Brownlee Bowdoin & Wolter, P.A.
390 North Orange Avenue, Suite 2500
Orlando, Florida 32801
Telephone: (407) 926-7705
Facsimile: (407) 926-7720

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I hereby certify that a true and correct copy of the above Amendment was furnished by First Class Mail to: the Commissioner for Patents, MAIL STOP FEE AMENDMENT, P.O. Box 1450, Alexandria, VA 22313-1450 on this 24th day of March, 2004.


Grayce A. Lichtenberger